



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT application of:

Applicant: James Robert Durrant et al.

Examiner: Lyle A. Alexander ✓

Serial No.: 09/673,538 ✓

Art Unit: 1743 ✓

Filing date: October 17, 2000 ✓

Title: BIOCHEMICAL DEVICES AND THEIR METHODS OF MANUFACTURE

Docket No. DYOUP0204US

REPLY TO OFFICE ACTION DATED DECEMBER 21, 2000

Commissioner for Patents  
Washington, D.C. 20231

Sir:

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Favorable reconsideration of the above-captioned application is respectfully requested in view of the following remarks.

Claims 1-3 and 17 were rejected as being anticipated by Kossovsky et al. U.S. Patent No. 5,585,646 or the Gerfin et al. article. Claims 1-21 were rejected as being unpatentable over the characterization of WO 96/00198 in the International Preliminary Examination Report.<sup>1</sup> It is respectfully submitted that the rejections are improper and should be withdrawn for at least the following reasons.

Neither Kossovsky et al. nor Gerfin et al. disclose a biosensor which includes a nanocrystalline semiconductor film having a protein immobilized thereon and as such neither anticipate the independent claims.

Gerfin et al. disclose (see pages 386 to 387, Section 7) the possibility of

<sup>1</sup> Regarding claims 5-16 and 18-21, it is noted that in the International Preliminary Examination Report, the claims were deemed to lack inventive step because the features thereof are not surprising in the technical field of biosensors. Consequently, the rejection is fundamentally deficient as it relies on a standard not applicable under the patent laws of the United States.

immobilizing molecular hosts on the surface of nanocrystalline  $\text{TiO}_2$ . Specifically, a  $\text{TiO}_2$  electrode having the vitamin  $\text{B}_{12}$  immobilized thereon is disclosed as a sensor for alkylating agents.

However, as would be understood by a person skilled in the art, the mere fact that one species, here vitamin  $\text{B}_{12}$ , is immobilized on a material, here  $\text{TiO}_2$ , is not an indicator that another species such as a protein, would be immobilized by that material. Immobilization mechanisms differ from species to species. This is particularly the case here where vitamin  $\text{B}_{12}$  is a small molecule and proteins are macromolecules. A person skilled in the art would simply not have considered a nanocrystalline film as being suitable to immobilize proteins which are of a size not substantially smaller than the porosity in nanocrystalline films. It is a most surprising effect of the invention that proteins, as macromolecules, are immobilized on nanocrystalline films.

Kossovsky et al. disclose a bio-electronic device based on a semiconductor substrate. They do not disclose or suggest the use of a nanocrystalline semiconductor film.

With regard to WO 96/00198, there is disclosed a nanocrystalline  $\text{TiO}_2$  film with a list of some possible uses thereof. The list includes sensors and the immobilization of enzymes, but there is no explicit connection between the two. In particular, the document itself is concerned with ceramic layers principally for solar cells with further uses listed. There is a claim to immobilization of enzymes and this is for use in biotechnology (Anspruch 8) and there is another unrelated claim to the use of  $\text{TiO}_2$  as a gas sensor (Anspruch 10). It should be noted that at the time this document was written  $\text{TiO}_2$  was known as a gas sensor, while there was no example of the use of  $\text{TiO}_2$  as a biosensor. The use of  $\text{TiO}_2$  for sensing and protein immobilization referred to in this document are unrelated. Thus, WO 96/00198 does not disclose or even suggest a biosensor comprising a nanocrystalline semiconductor film with a protein immobilized thereon.

Regarding a housekeeping matter, the Examiner deleted EP 0 596 421 from Form 1449 submitted with the Information Disclosure Statement submitted on October 17, 2000, for want of a translation or characterization. It is noted, however, that said document was cited in the International Search Report, a copy of which has been supplied. Accordingly, acknowledgment of consideration of said document is respectfully requested.

Request also is again made for issuance of a filing receipt. No filing receipt has been received by the undersigned.

This application is believed to be in condition for allowance and an early action to that effect is earnestly solicited.

Respectfully submitted,



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Date: 3-21-02



Don W. Bulson